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a Viscous Liquid when Referred to Cylindrical and Polar Co-ordinates,' by Professor P. E. Doudna, 'The Capricorns, Mammals of an Asiatic Type, Former Inhabitants of the Pike's Peak Region,' by Dr. F. W. Cragin; 'Buchiceras (Sphenodiscus) Belviderensis and its Varieties,' by Dr. F. W. Cragin; 'The Number Concept,' by Dr. F. Cajori.

BOOKS RECEIVED.

Das Tierreich, 9 Lieferung, *Aves-Trochilidae*. ERNST HARTERT. Berlin, R. Friedländer und Sohn. 1900. Pp. ix + 254. Subscription price, 12 mark.

Bird Studies with Camera. FRANK M. CHAPMAN. New York, D. Appleton & Co. 1900. Pp. xiv + 214.

La spéléologie ou science des cavernes. E. A. MARTEL. Paris, Georges Carré & C. Naud. 1900. Pp. 126.

Æther and Matter. JOSEPH LARMOR. Cambridge, The University Press. New York, The Macmillan Company. 1900. Pp. xxviii + 365. 10s.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *American Journal of Science* for June contains the following articles:

Method of Studying the Diffusion (Transpiration) of Air through Water, and on a Method of Barometry. C. BARUS.

Separation and Determination of Mercury as Mercurous Oxalate. C. A. PETERS.

Electrical Resistance of Thin Films Deposited by Cathode Discharge. A. C. LONGDEN.

New Meteorite from Oakley, Logan County, Kansas. H. L. PRESTON.

Observations on Certain Well-Marked Stages in the Evolution of the Testudinate Humerus. G. R. WIELAND.

Chemical Composition of Sulphohalite. S. L. PENFIELD.

Phases of the Dakota Cretaceous in Nebraska. C. N. GOULD.

Geothermal Gradient in Michigan. A. C. LANE.
Production of the X-Rays by a Battery Current. J. TROWBRIDGE.

American Chemical Journal, May, 1900.
"Preparation and properties of the so-called 'Nitrogen Iodide,'" by F. D. Chattaway and K. J. P. Orton. Preparation from iodine monochloride and ammonia; 'The action of reducing agents upon nitrogen iodide,' by F. D. Chattaway and H. P. Stevens. Decomposition with

formation in every case of hydriodic acid; 'On certain colored substances derived from nitro compounds,' by C. L. Jackson and F. H. Gazzolo; 'The solution-tension of zinc in ethyl alcohol,' by H. C. Jones and A. W. Smith; 'Notes on lecture experiments to illustrate equilibrium and dissociation,' by J. Stieglitz; 'A contribution to the knowledge of tellurium,' by F. D. Crane. Method of purifying tellurium and detecting small quantities of it; 'The constitution of gallein and coerulein,' by W. R. Orndorff and C. L. Brewer; 'Permanganic acid by electrolysis,' by H. N. Morse and J. C. Olsen; 'On chlorine heptoxide,' by A. Michael and W. T. Conn.

J. ELLIOTT GILPIN.

SOCIETIES AND ACADEMIES.

SCIENCE CLUB OF THE UNIVERSITY OF WISCONSIN.

At the meeting of the Science Club of the University of Wisconsin, held May 22d, Mr. J. B. Johnson presented a paper on 'Recently improved Methods of Sewage disposal.' The paper was devoted to a consideration of the principles underlying modern methods of treatment rather than the details of construction of sewage plants. The chemical and the bacteriological methods of sewage disposal were contrasted and the former shown to be too largely an artificial process, since it fails to make use of nature's effective agents—the bacteria—which when afforded suitable conditions change organic wastes into soluble products and finally into the inorganic nitrates and nitrites which constitute so largely the food of plants. The chemical precipitation plants were considered as belonging to a past stage in the development of sanitary science, and wherever installed are now looked upon as an incubus to be got rid of as soon as possible.

The combined septic tank and contact bed method, which was first used at Exeter, England, in 1896, and which is throughout a bacteriological method, Mr. Johnson regards as the most satisfactory solution of the sewage problem. The essential peculiarity of the method is that it affords in the septic tank to which the sewage is first conducted the ideal conditions for the action of the anærobic bacteria whose function

it is to reduce the organic matter by putrefaction to soluble compounds. Further, in the coarsely porous and intermittently aerated contact beds, in which the soluble material from the septic tank is allowed to stand, are afforded the best conditions for the action of the aerobic or nitrifying bacteria. Experience with this method shows that even the solid material from the raw sewage, which in the septic tank is differentiated as a scum at the surface and a deposit at the bottom, is also slowly acted upon by the bacteria so that the quantity in the tank is not appreciably changed after the colonies have become firmly established. In the contact beds also the aerobic bacteria establish their colonies in a few weeks and appear in the form of slime, which adheres to the surface of the cinder or other porous material composing the bed. Before passing from the septic tank to the contact beds the effluent is aerated by allowing it to flow in thin films over weirs. "Perhaps never in the history of engineering," said Mr. Johnson, "has a new process, as revolutionary as this one, established itself so quickly with the highest authorities as has this new and simple method of sewage disposal."

In discussing the paper Mr. H. L. Russell likened the earlier attempts to accomplish the bacteriological purification of sewage in a single process to an attempt to raise the subtropical rice and the temperate to subpolar barley in the same field. Mr. F. E. Turneaure also discussed the paper, emphasizing both the cheapness and the efficiency of the new method. The paper and the discussion aroused much local interest, due partly to the fact that the city of Madison against the advice and the urgent protest of members of the Science Club, recently installed an expensive chemical plant for disposal of its sewage, but has now been compelled to abandon it as a complete failure and has elected Mr. F. E. Turneaure to be City Engineer.

Mr. Johnson's paper will probably be published as a Bulletin of the University of Wisconsin.

Officers of the Club for the ensuing year were elected as follows: Mr. E. A. Birge, President; Mr. C. S. Slichter, Vice-President; Mr. E. R. Maurer, Secretary and Treasurer.

WM. H. HOBBS.

DISCUSSION AND CORRESPONDENCE.

REPLY TO PROFESSOR KINGSLEY'S CRITICISM.

ONLY about a week ago my attention was called to the criticism by Professor Kingsley of my little book entitled 'Outline of Comparative Physiology and Morphology' in SCIENCE of April 27th. I delayed answering because I was at that time too much absorbed by many duties connected with the close of the academic year to allow my mind to be distracted by unpleasant matters. I am now at comparative leisure and undertake to show that many at least of his criticisms are unjust.

His points of criticism may be classified under several heads:

1. First and most numerous are general statements which are true but not without exceptions. This was unavoidable in a bare *outline* such as the work professed to be. Our distinctions in science are always sharper than in nature. This is especially true in elementary science. If exact details and all exceptions were given we should certainly fail to give a clear outline to be filled in by subsequent study. Under this head come—(a) the failure to make exception of Fungi in giving the broad distinction between animals and plants in the nature of their food. If I had attempted absolute exactness I should have been compelled not only to make exception of greenless plants, but to have discussed the economy of carnivorous plants, and the question whether all plants, even the greenest, do not supplement their mineral food with more or less of organic food. And then what would have become of my *Outline*? The very first necessity in an elementary work is to renounce much, very much that we should like to introduce. (b) Under the same head comes the statement that animals by virtue of the nature of their food must have a stomach, without mentioning some exceptions among parasites, as the tapeworm. (c) In speaking of the general absence of the middle ear in amphibians I did not make exception of Anura. (d) In omitting mention of distinct renal organs in Phyla lower than Mollusca. Surely these objections are hypercritical although in some cases especially (c) a foot-note might be added giving exceptions.

2. I said the last group may be regarded as